



# Coupled Carbon Simulations with CESM-(BGC)

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TSS: G. Bonan, D. Lawrence, P. Lawrence, S. Levis

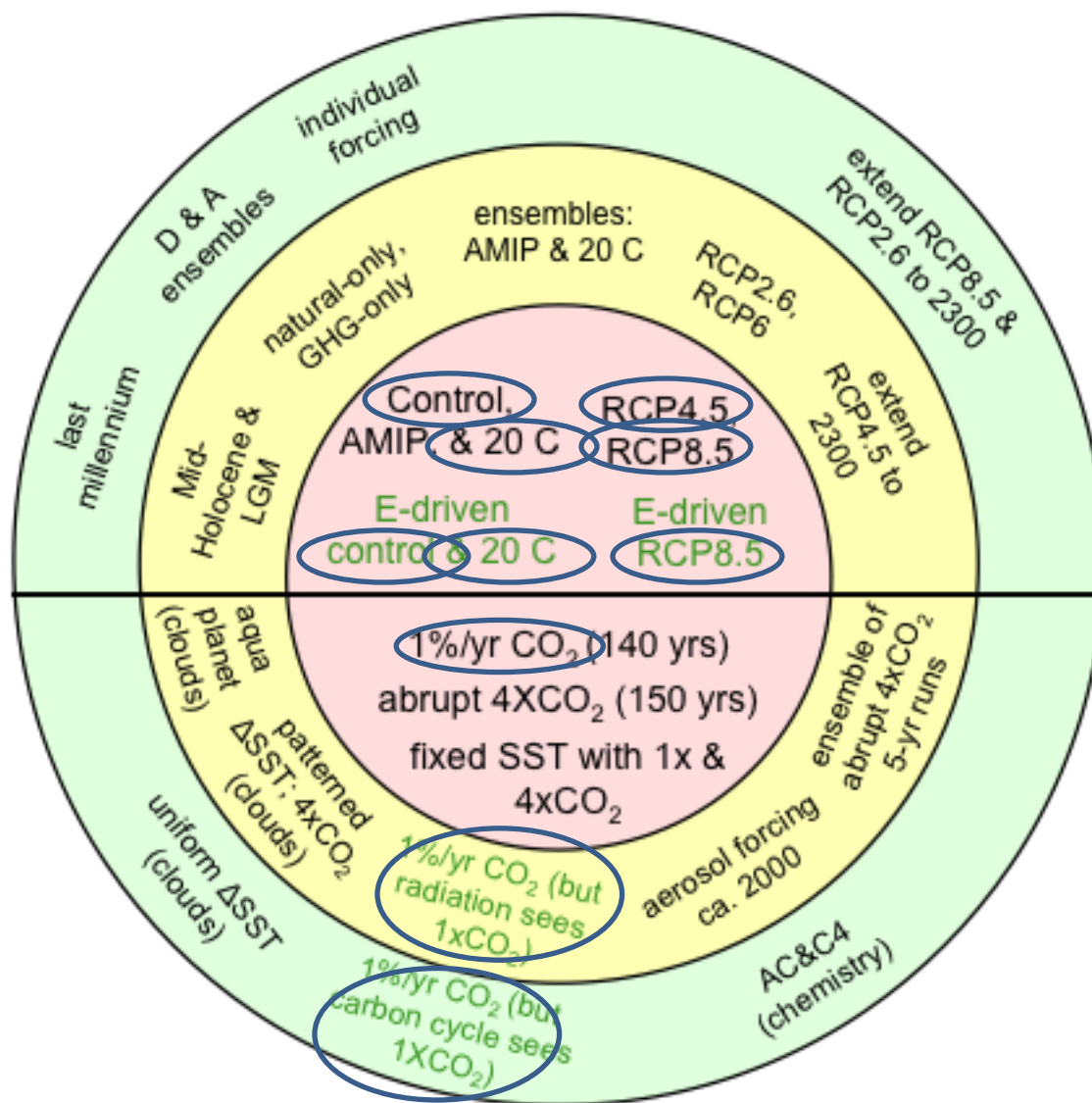
CSEG: M. Vertenstein, N. Norton, T. Craig

Ocean BGC PIs: K. Moore, S. Doney

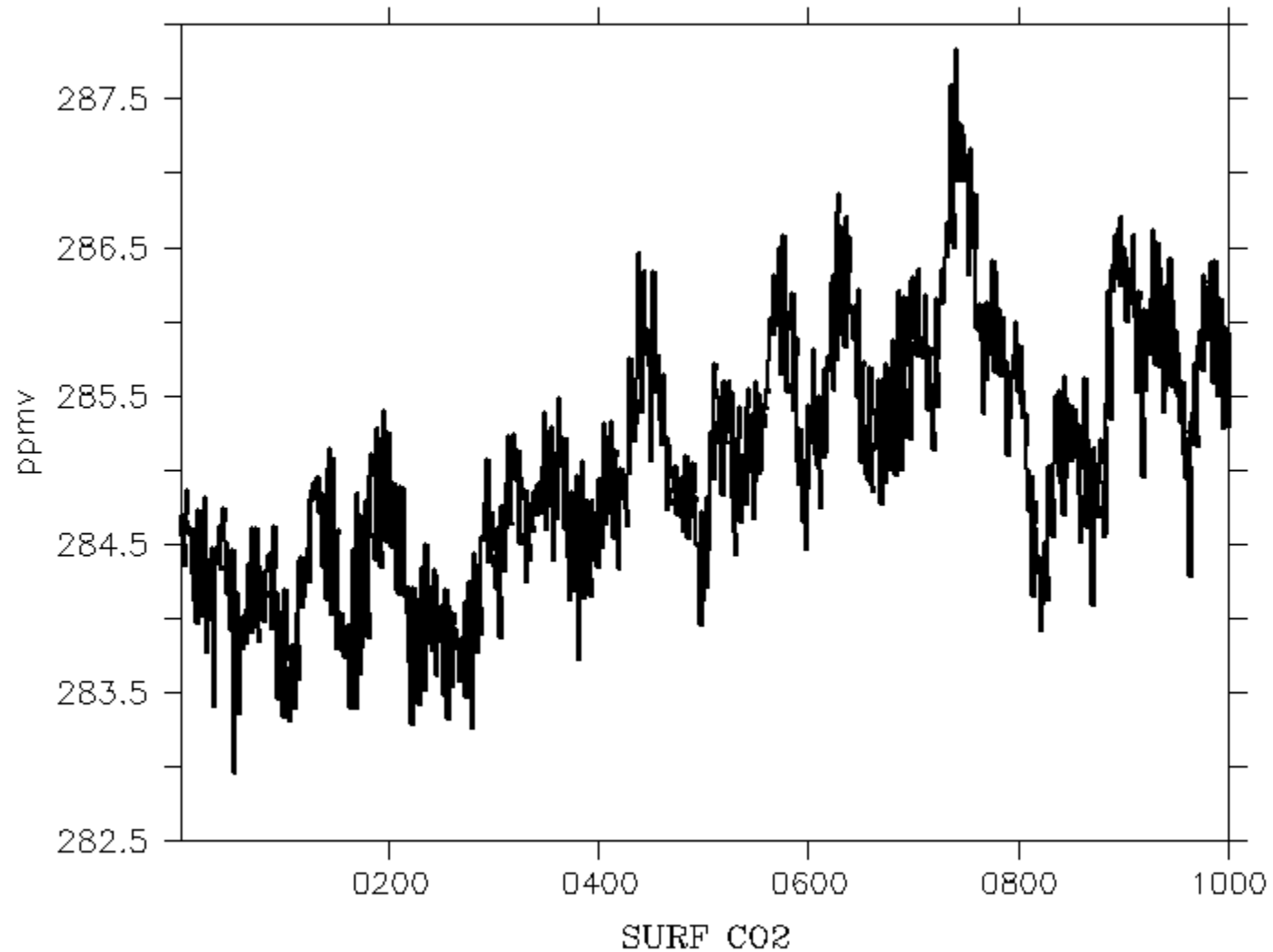
BGCWG Co-chairs: N. Mahowald, J. Randerson

NCAR is sponsored by the National Science Foundation

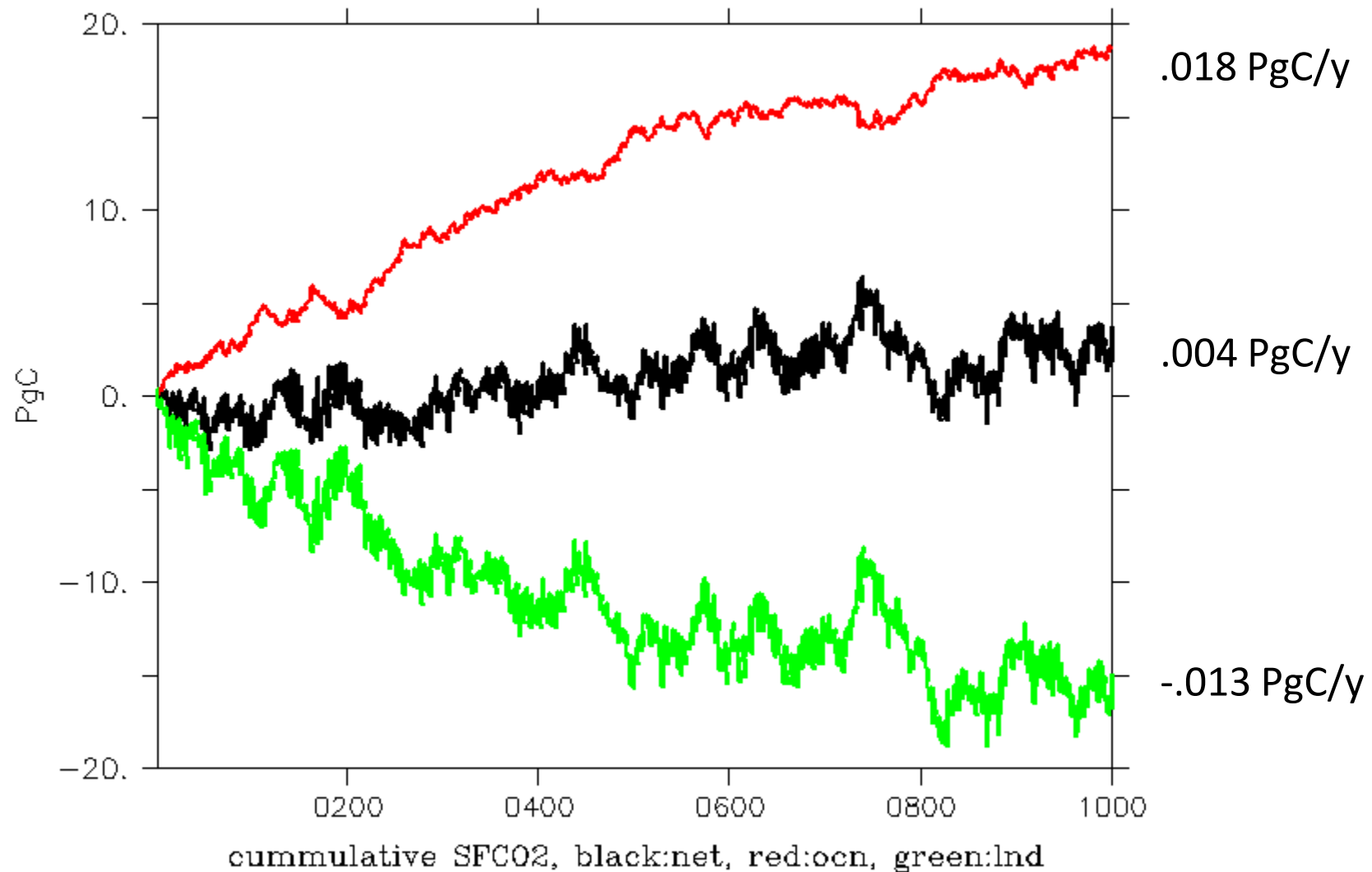
# CMIP5 Long-Term Experiments



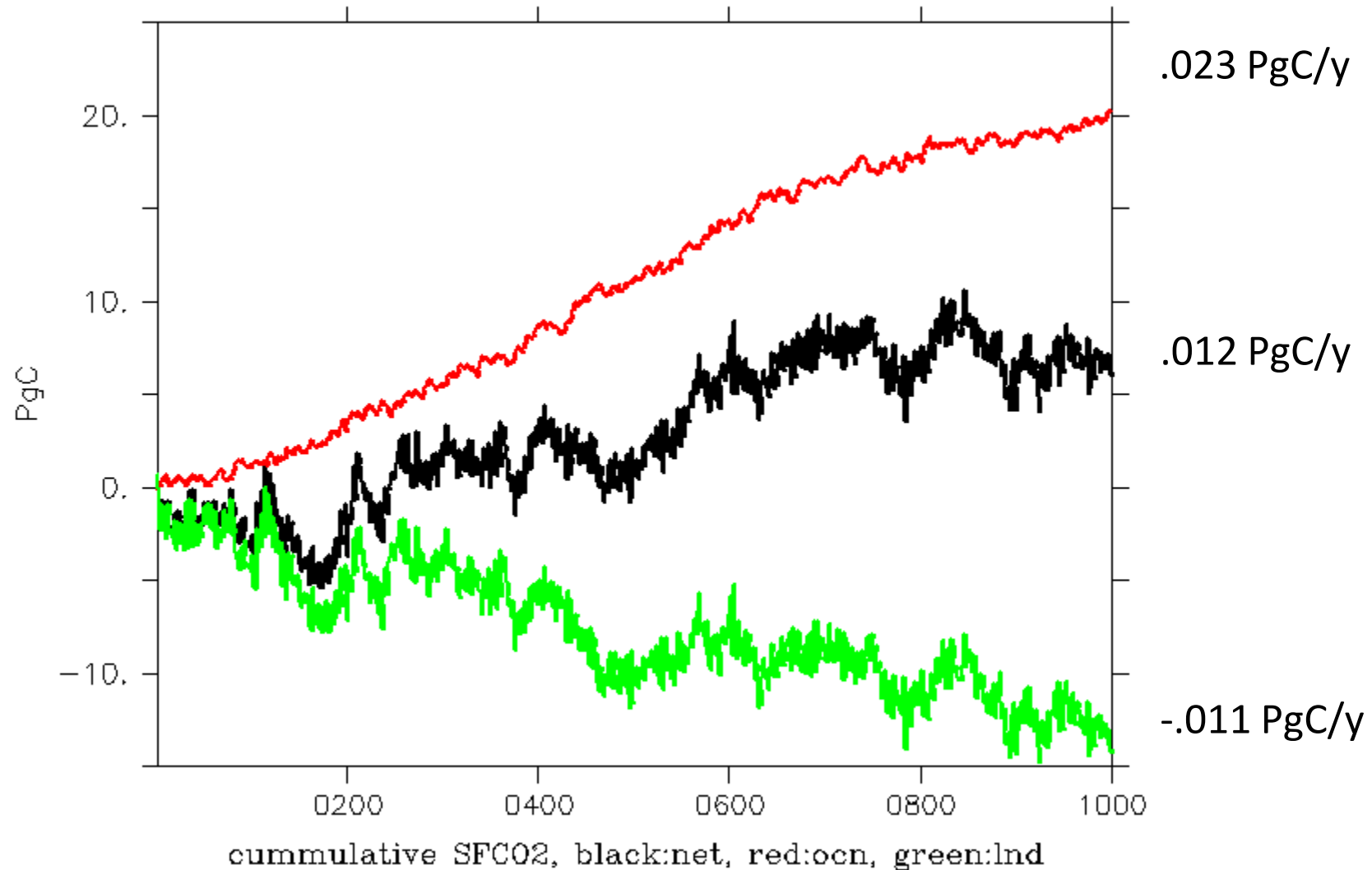
# Prognostic CO<sub>2</sub> 1850 Control

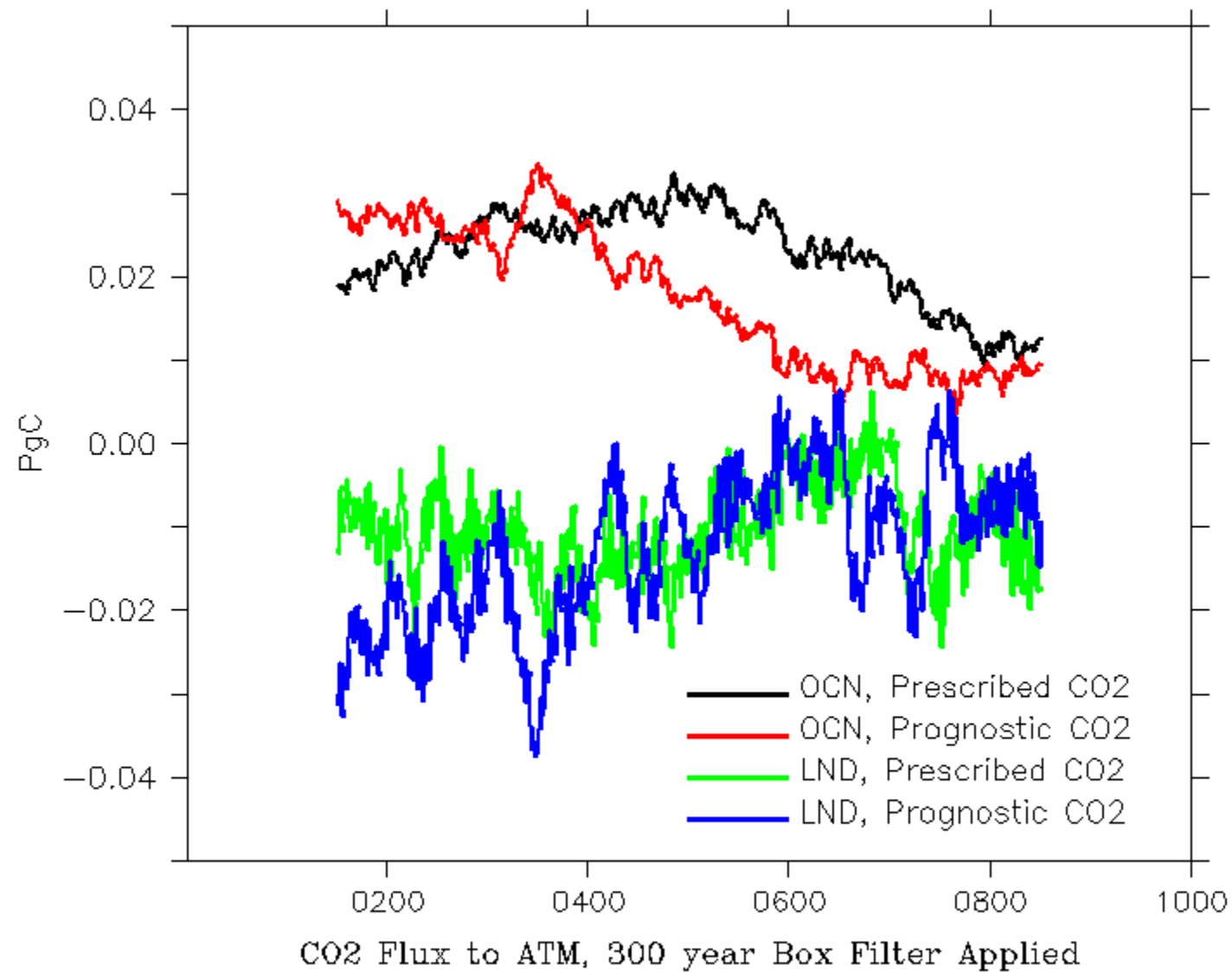


# Prognostic CO<sub>2</sub> 1850 Control

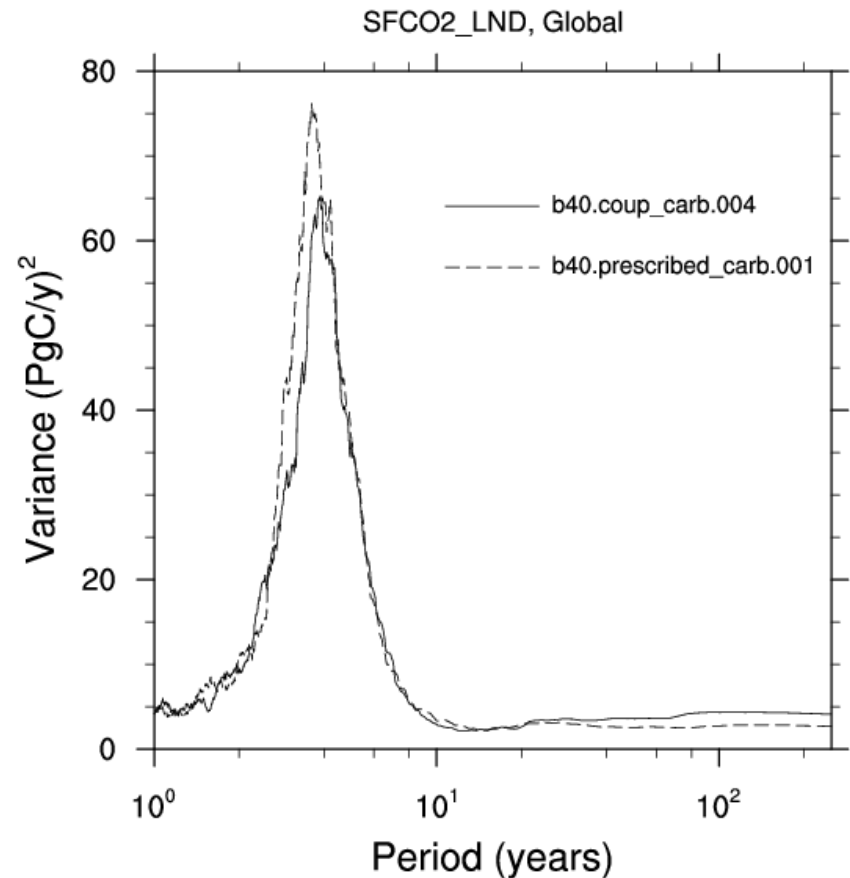
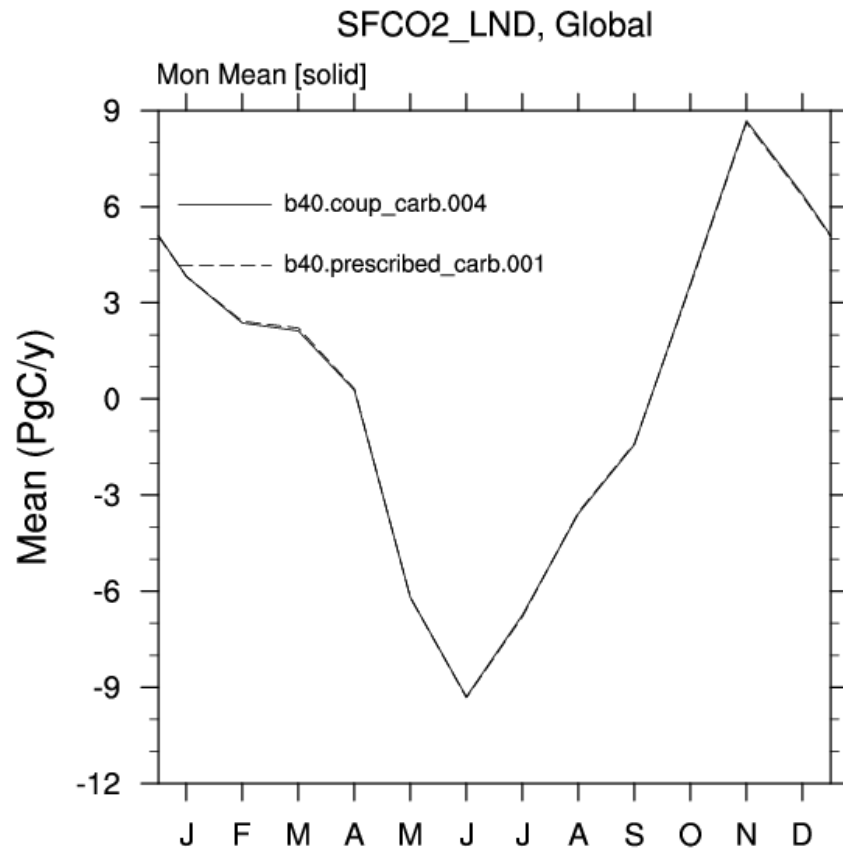


# Prescribed CO<sub>2</sub> 1850 Control

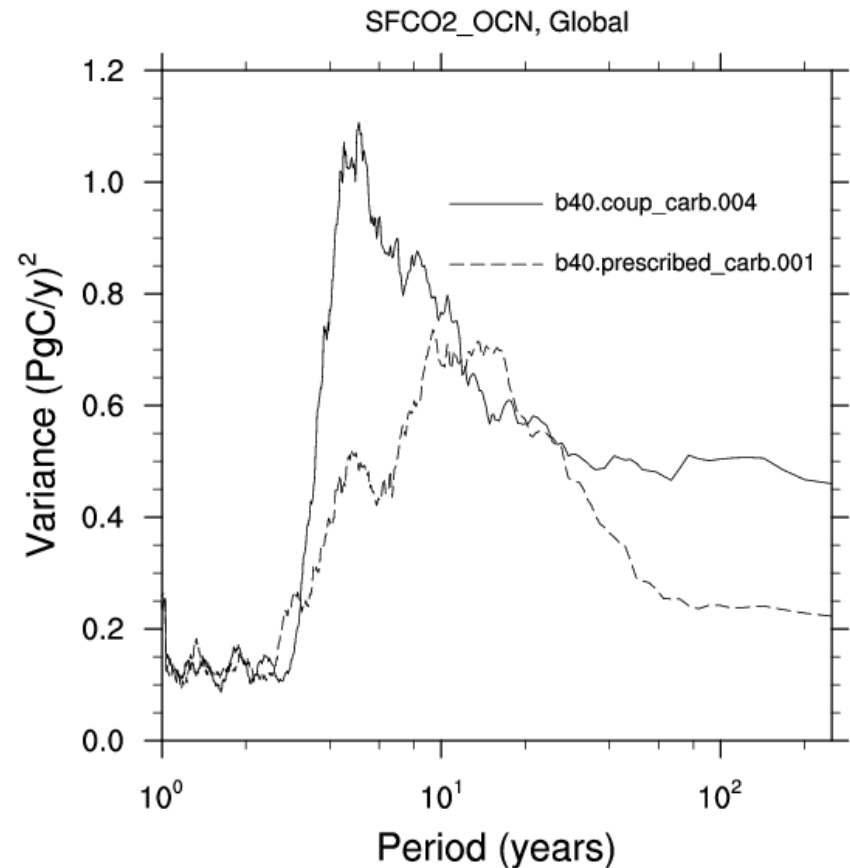
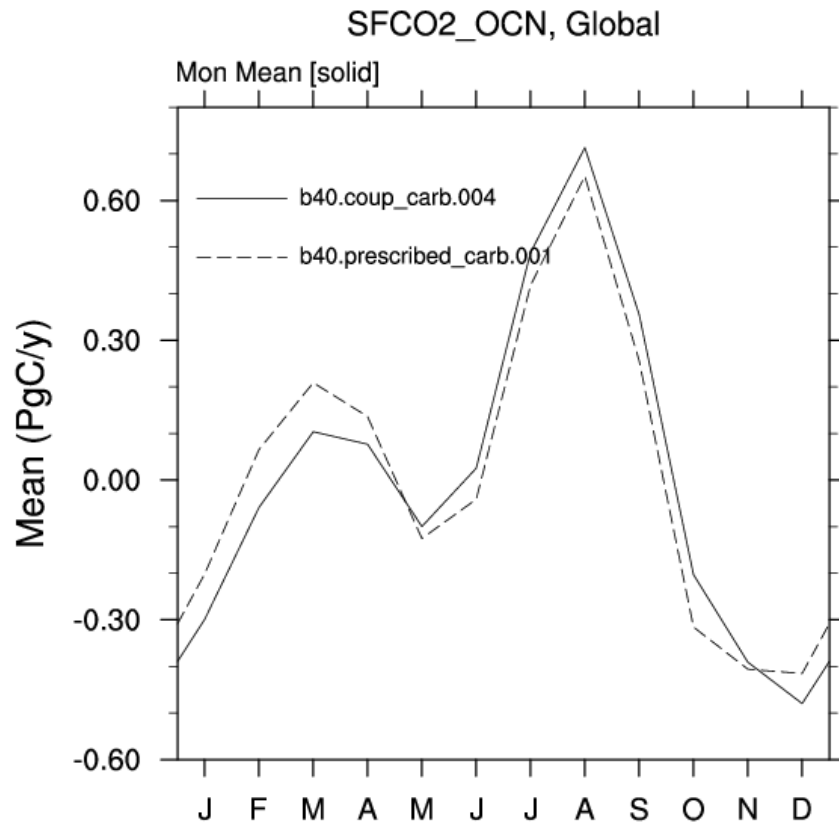




# Air-Land CO<sub>2</sub> Flux, 1850 Controls

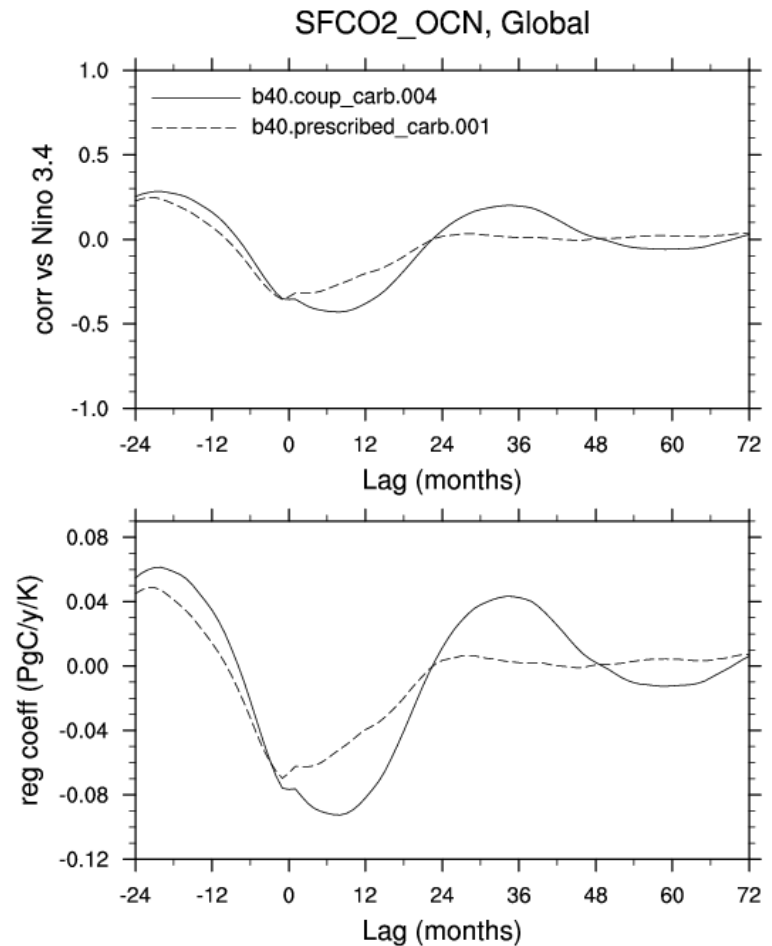
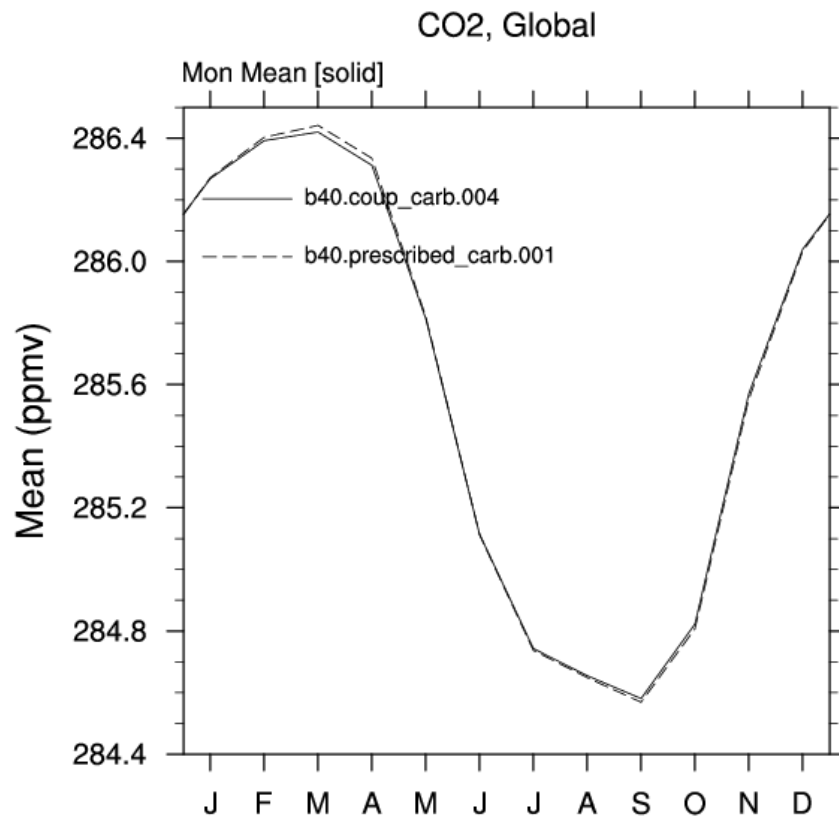


# Air-Sea CO<sub>2</sub> Flux, 1850 Controls

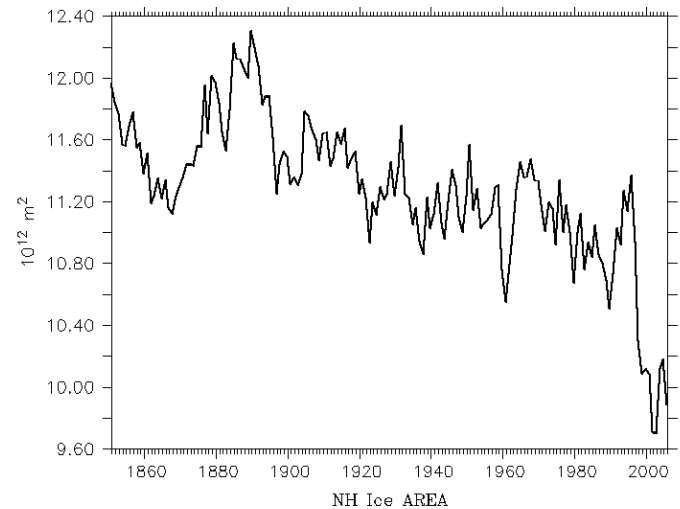
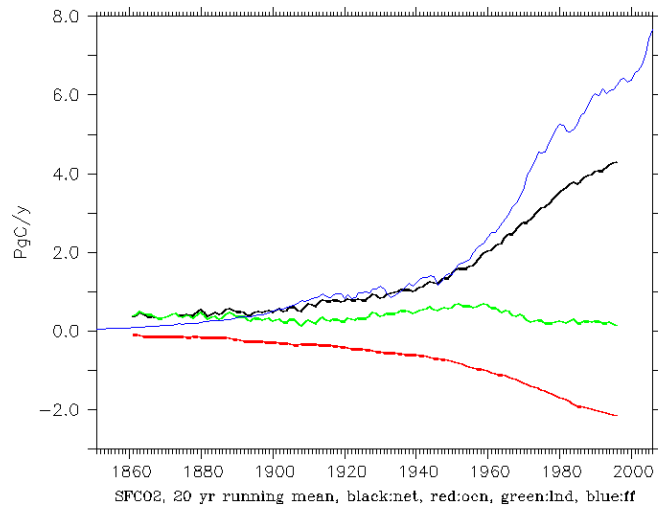
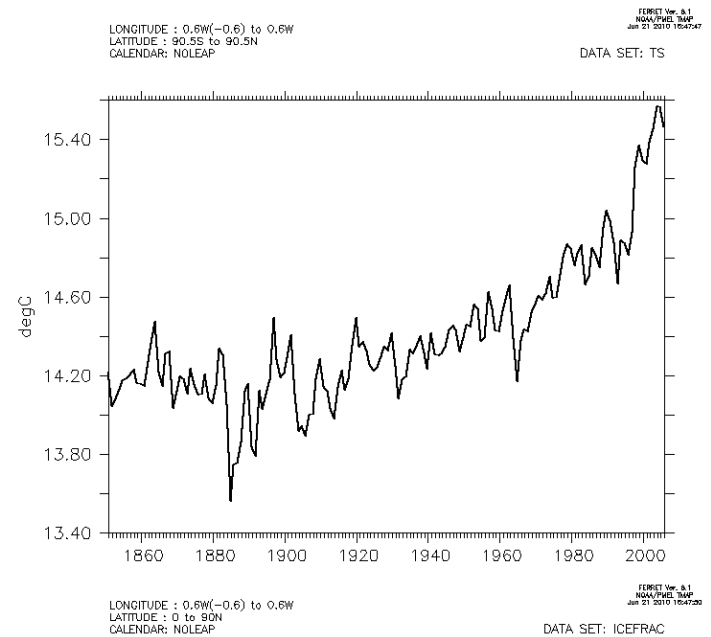
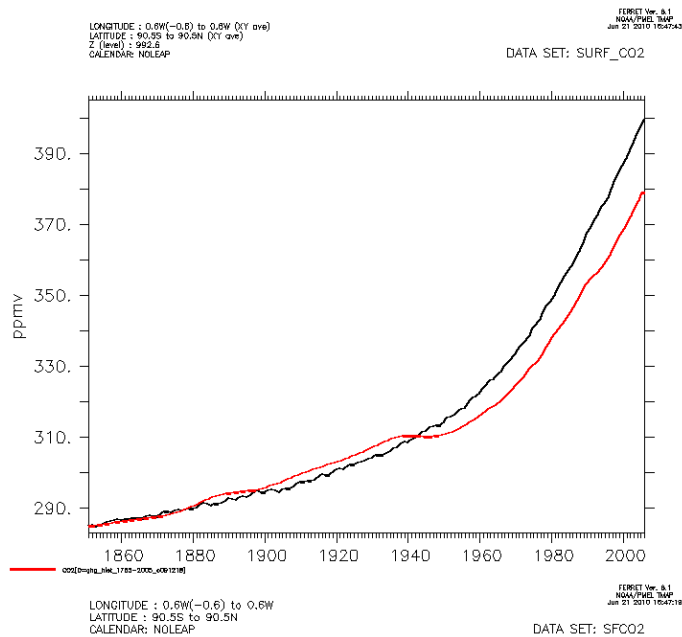




# Air-Sea CO<sub>2</sub> Flux, 1850 Controls

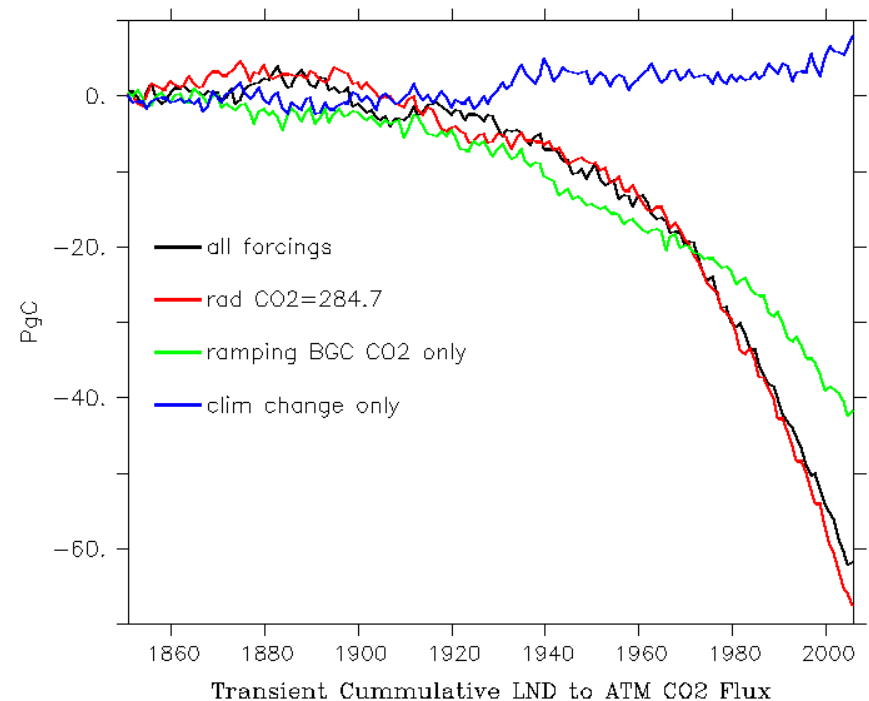
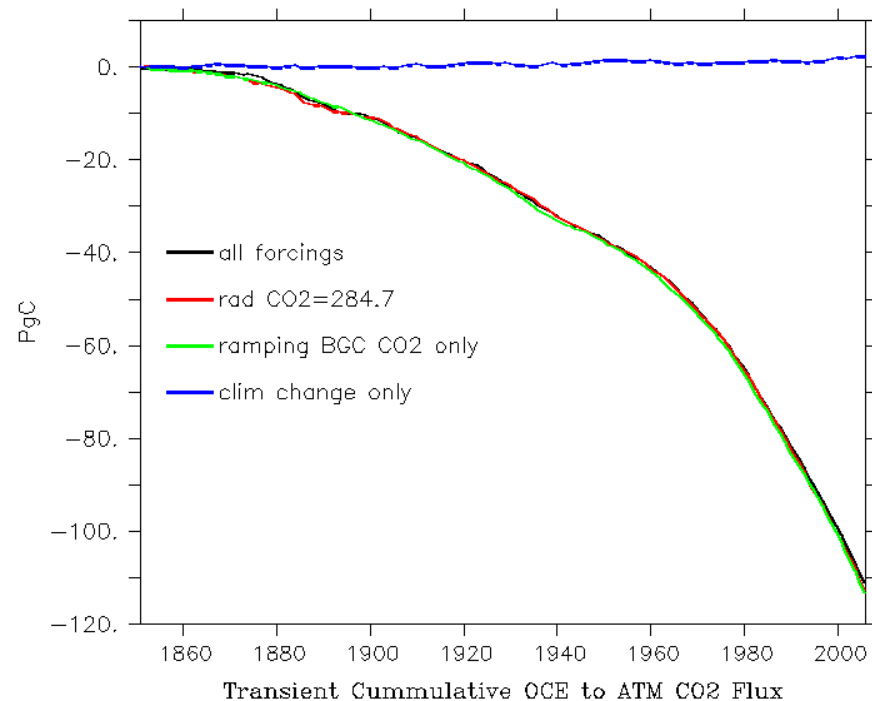


# 20<sup>th</sup> Century, Prognostic CO<sub>2</sub>

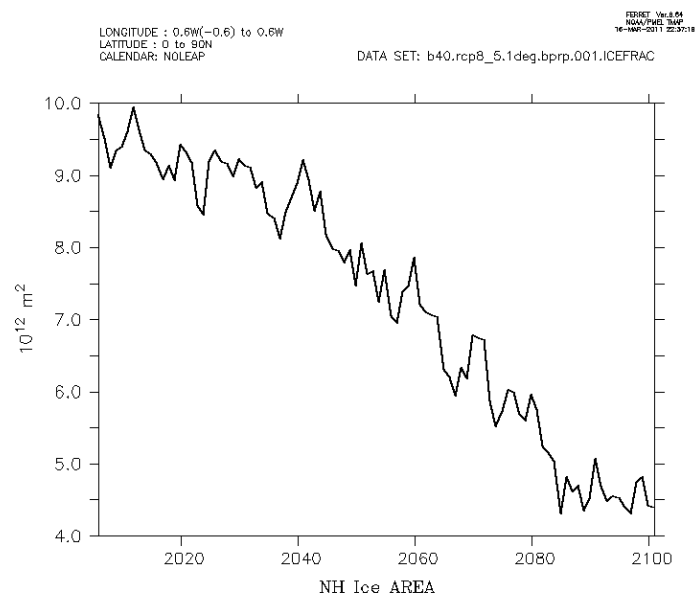
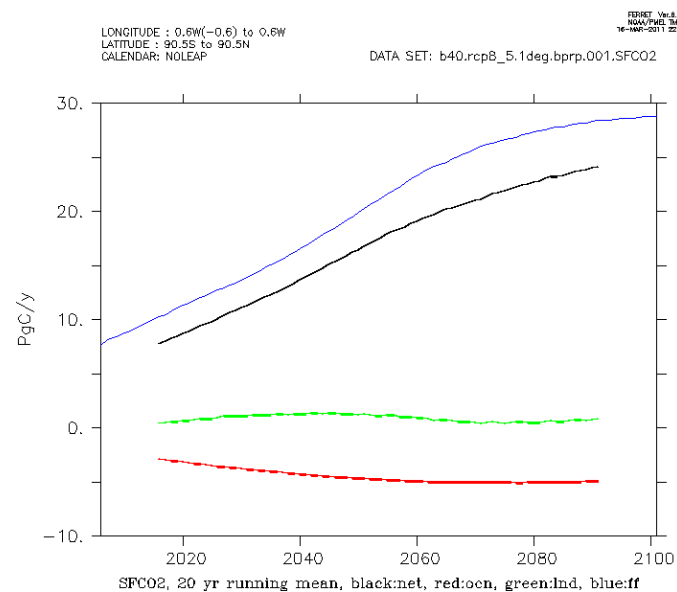
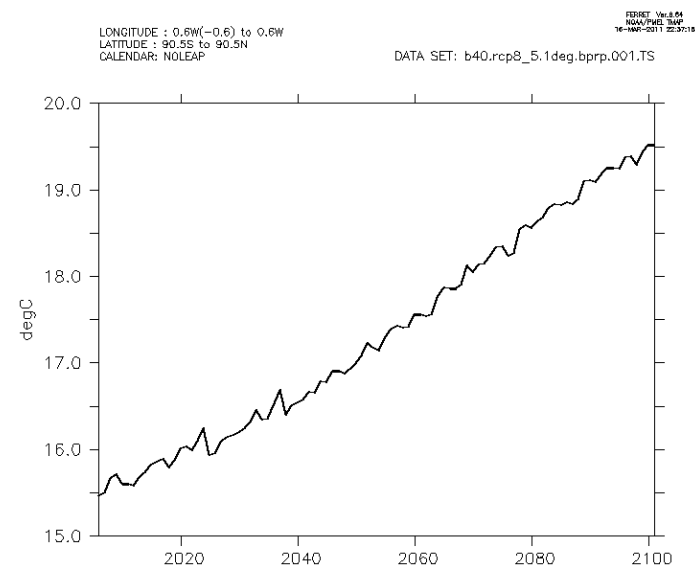
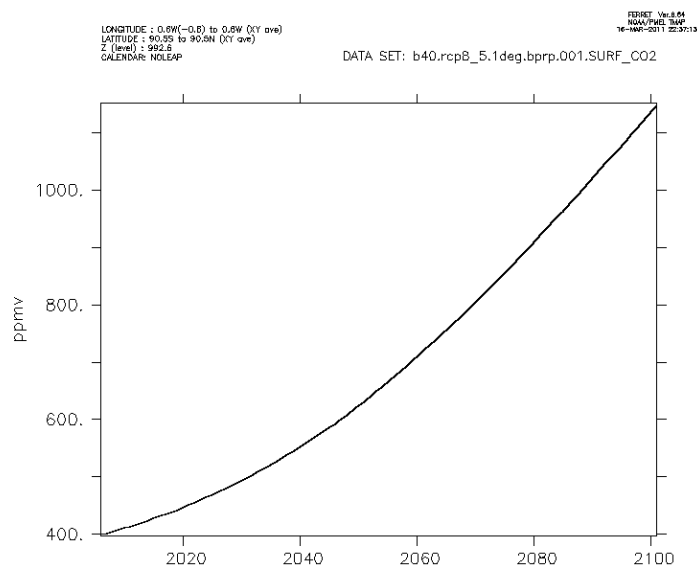


# Breakdown of 20<sup>th</sup> Century CO<sub>2</sub> Fluxes

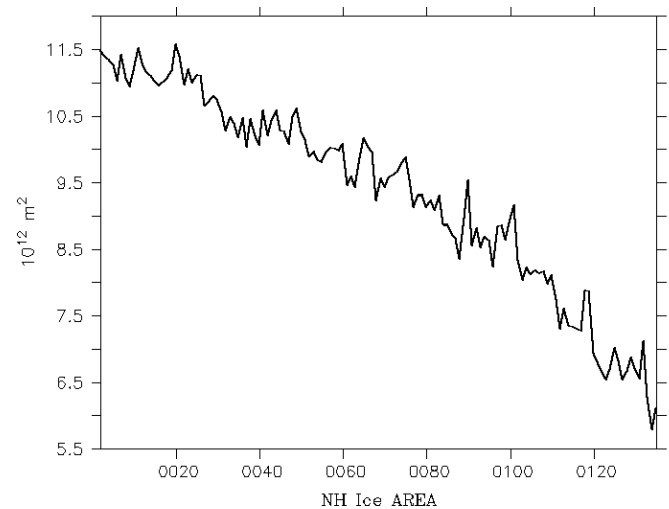
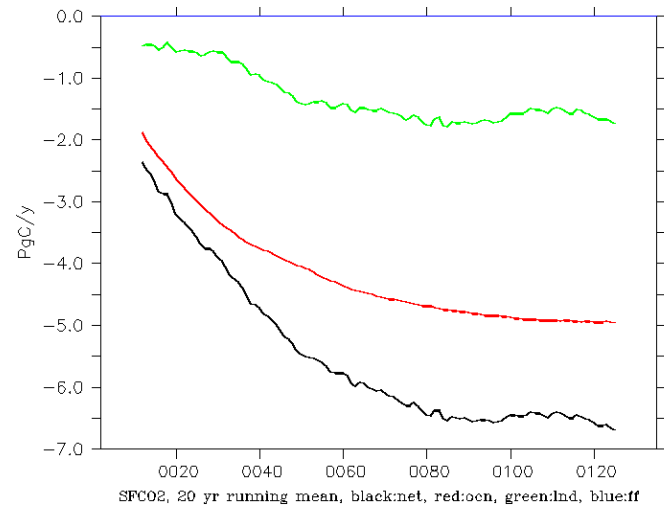
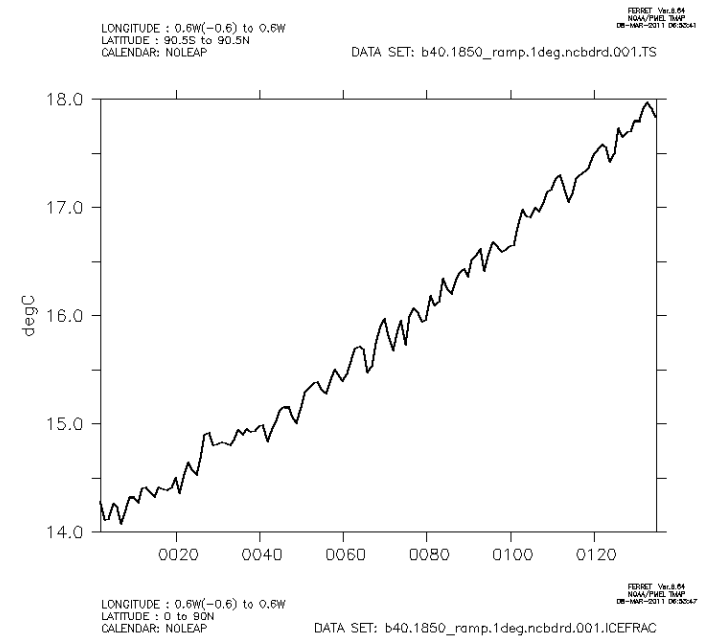
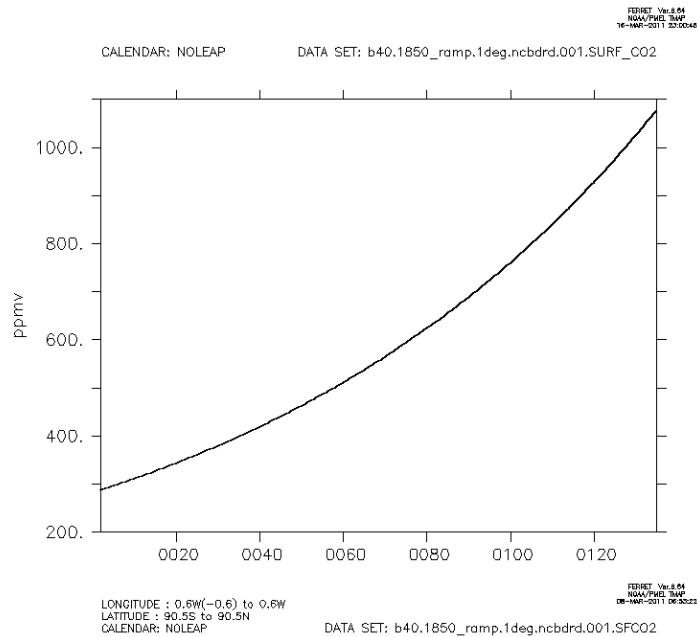
## Prescribed CO<sub>2</sub>



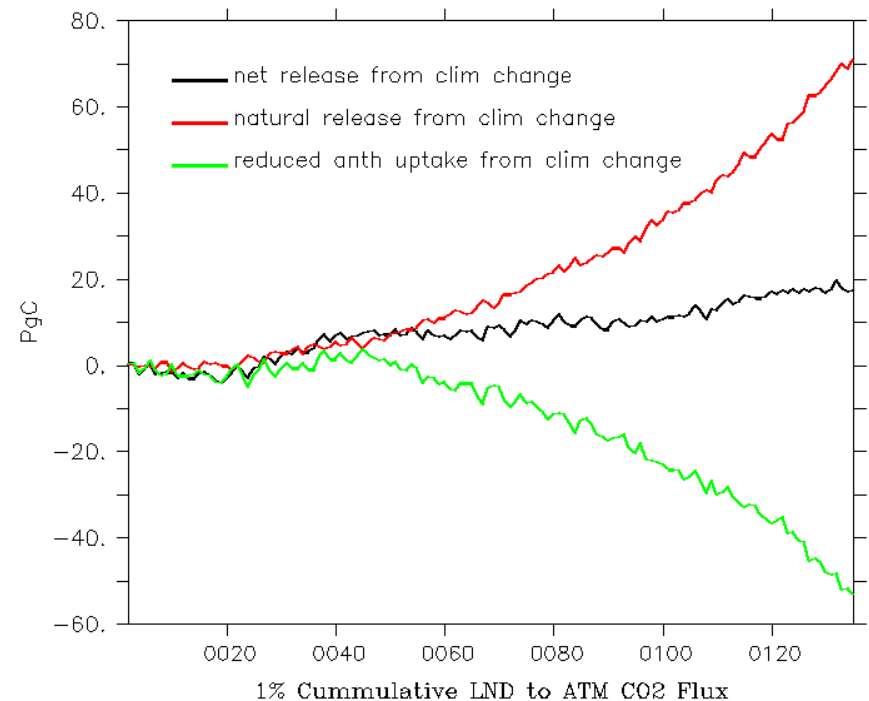
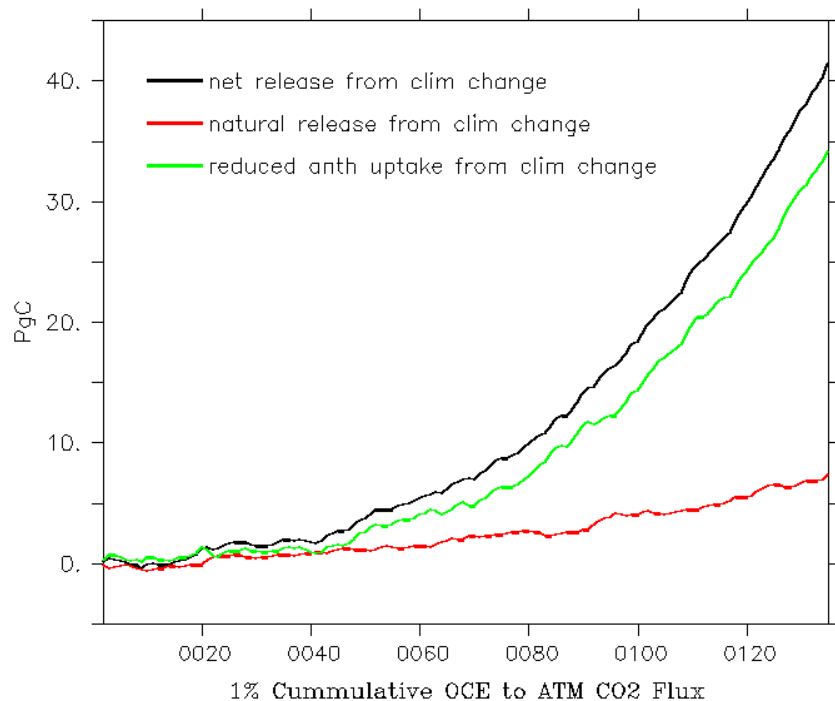
# RCP8.5, Prognostic CO<sub>2</sub>



# 1% CO<sub>2</sub>, Prescribed CO<sub>2</sub>



# Impact of Warming on CO<sub>2</sub> Fluxes



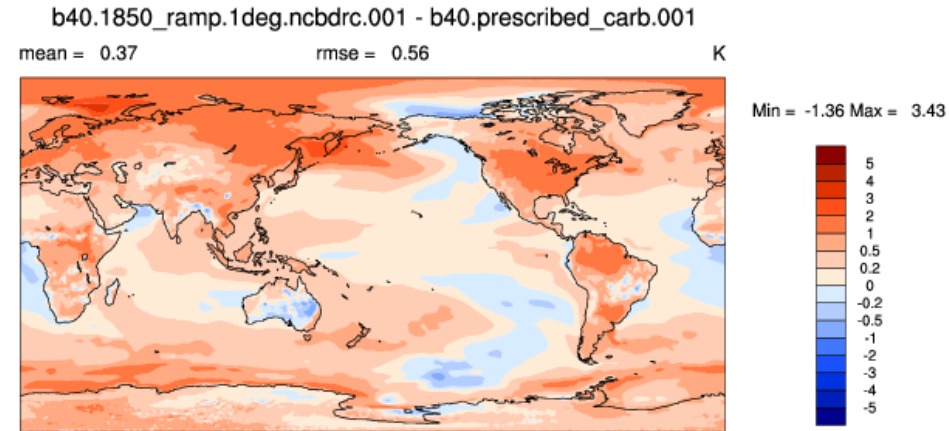
## CAVEAT:

Climate in constant climate experiment not so constant.

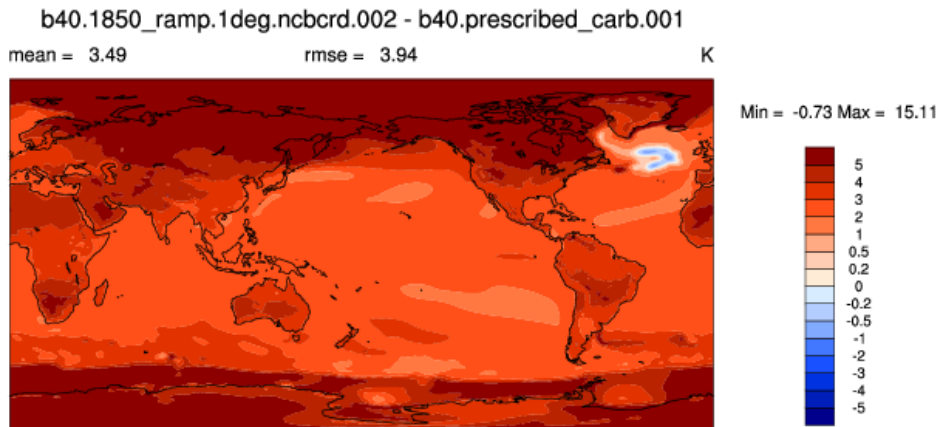
Greening of CLM warms the surface.

This may need to be taken into account in  $\beta$  &  $\gamma$  computations.

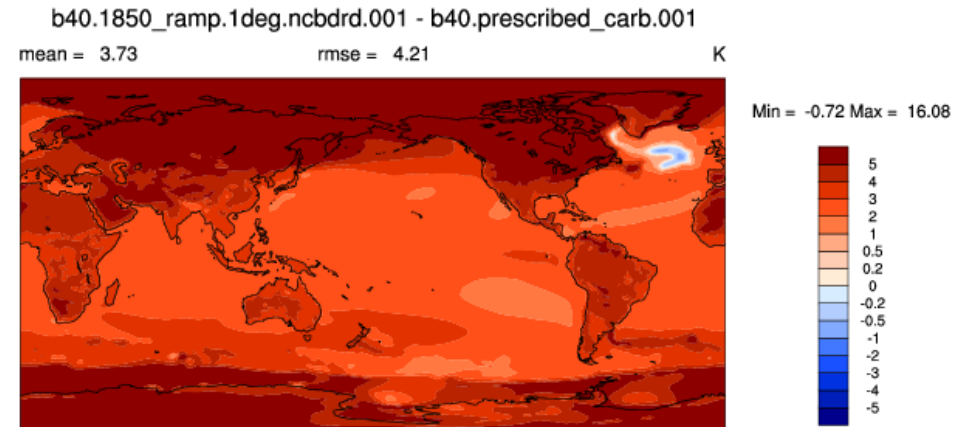
Magnitude of response probably depends on CAM physics.



$\Delta TS$  from  $\Delta BGC CO_2$



$\Delta TS$  from  $\Delta RAD CO_2$



$\Delta TS$  from  $\Delta BGC$  &  $\Delta BGC CO_2$

# Summary & What's Next

- CMIP5 runs nearly complete
  - Control, 20<sup>th</sup> C, RCPs, 1% CO<sub>2</sub> Ramp
- Analysis of Runs is Ongoing
  - Being written up for CESM J Clim Spec Issue
- Public Release of Model Output
- More Specialized Papers
- Next Model Release in Fall-Winter 2012